For Your Information

New NSF Institutes Announced

The Division of Mathematical Sciences (DMS) of the National Science Foundation (NSF) has made three new awards and one continuing award for mathematical sciences institutes. Start-up funding for the new institutes will begin this year, and full funding is expected to commence in 2003. The new awards are projected to total $24.8 million over five years; the continuing award is for $9 million over six years. What follows is a brief description of each of the new institutes.

The AIM Research Conference Center (ARCC) will hold focused workshops in the mathematical sciences, initially at the American Institute of Mathematics (AIM) in Palo Alto and later at a new facility in Morgan Hill adjacent to an 80,000-acre state park. ARCC focused workshops will be distinguished by collaboration on a specific mathematical goal, such as a significant unsolved problem, an important new result, or the convergence of two distinct areas. ARCC will emphasize collaborations that include women, minorities, new mathematicians, and researchers at primarily undergraduate institutions. Central to each workshop will be a public website that will outline the specific goal and subsequently serve as a comprehensive research resource. Brian Conrey has been director of AIM since its founding; prior to that he was on the faculty of Oklahoma State University. The ARCC website may be found at `http://www.aimath.org/ARCC/`.

The Mathematical Biosciences Institute (MBI) at the Ohio State University will be a base for interdisciplinary work by mathematical scientists and biological scientists on a broad range of biological problems. The mission of the MBI is (i) to develop mathematical theories, statistical methods, and computational algorithms for the solution of fundamental problems in the biosciences; (ii) to involve mathematical scientists and bioscientists in the solution of these problems; and (iii) to nurture a community of scholars through education and support of students and researchers. The MBI will establish emphasis year programs, current topics workshops, educational programs, and sponsored research projects. The director of the institute is Avner Friedman, who served as director of the Institute for Mathematics and its Applications at the University of Minnesota from 1986 to 1997. Further information about the MBI may be found at the website `http://mbi.osu.edu/`.

The Statistical and Applied Mathematical Sciences Institute (SAMSI) is a partnership of Duke University, North Carolina State University (NCSU), the University of North Carolina at Chapel Hill (UNC), and the National Institute of Statistical Sciences in Research Triangle Park (NISS). SAMSI will forge a new synthesis of the statistical sciences with the applied mathematical sciences and other disciplinary sciences to confront data- and model-driven scientific challenges. Many of these challenges are complex and large, requiring collaborative efforts. SAMSI will have long- and short-term visitors at the postdoctoral-through-senior levels and will also involve graduate and upper-level undergraduate students. James Berger of the Institute of Statistics and Decision Sciences at Duke University is the director, with H. T. Banks of NCSU, J. S. Marron of UNC, and Alan F. Karr of NISS also serving on the directorate. SAMSI's website may be found at `http://www.samsi.info/`.

The continuing award is for the School of Mathematics at the Institute for Advanced Study. The School of Mathematics has for many years received NSF funding for partial support of its visitor program, and this funding will continue through the mathematical sciences institutes program of the DMS. Long- and short-term visitors in a wide range of mathematical areas spend time at the School of Mathematics, either to do independent research or to participate in one of the school's special yearly programs. The executive officer of the School of Mathematics is Jean Bourgain. Information about the school's activities may be found at `http://www.math.ias.edu/`.

The new awards complement the existing three NSF-funded institutes: the Institute for Mathematics and its Applications (IMA) at the University of Minnesota; the Institute for Pure and Applied Mathematics (IPAM) at the University of California, Los Angeles; and the Mathematical Sciences Research Institute (MSRI) in Berkeley.

—Allyn Jackson

New Mathematics Center Established in Berlin

In May 2002, the Deutsche Forschungsgemeinschaft (DFG), the science funding agency of the German government, announced the establishment of a new research center, Mathematics for Key Technologies: Modeling, Simulation, and Optimization of Real-World Processes. Located in Berlin, this international center will develop mathematical methods for a wide spectrum of applications. The DFG will provide 21 million euros (about US$20 million) for the first four years of the center's work. Another 12 million euros of financial support will be added by local institutions in Berlin. The center began operation on June 1, 2002.

The research program for the center will be application-driven, addressing concrete problems that call for the development of new mathematical tools. The center will also help to bridge the gap between theoretical mathematics and users of mathematics in industry, science, and government. Building on the special strengths in mathematics in Berlin, the center will concentrate on optimization and discrete mathematics, numerical analysis and scientific computing, and applied and stochastic analysis. Among the technologies to be addressed initially are the life sciences, traffic and communication networks, industrial production, electronic circuits and optical technologies, finance, and visualization.

The mathematics department at the Technische Universität Berlin will lead development of the center, in cooperation with four other Berlin institutions: the Freie Universität, the Humboldt-Universität, the Weierstrass Institut für Angewandte Analysis und Stochastik, and the Konrad-Zuse-Zentrum für Informationstechnik. About sixty researchers at these five institutions will be involved in activities through the center. Martin Grötschel of the Technische Universität and the Konrad-Zuse-Zentrum is the designated coordinator for the center. The other members of the coordination committee are Peter Deuflhard (Freie Universität and Konrad-Zuse-Zentrum), Hans Föllmer (Humboldt-Universität), Volker Mehrmann (Technische Universität), and Jürgen Sprekels (Humboldt-Universität and Weierstrass Institut). The administration and main activities of the center will be located in the mathematics building of the Technische Universität.

Education, including at the graduate and undergraduate levels, will be a major focus of the center. New interdisciplinary programs and new types of courses will be developed. The center will also support advanced training courses for high school teachers and students, with the aim of bringing mathematical modeling and real-life applications into the classroom.

This center is the fourth of about ten to be funded under a DFG initiative, begun in May 2001, to establish interdisciplinary research centers; the other three centers are in the areas of ocean rims, functional nanostructures, and biomedical research concerning protein. Subject to periodic evaluations, the DFG-funded centers can receive support for up to twelve years. One of the aims of establishing these centers is to create research opportunities in Germany that can attract and retain top researchers, both from within Germany and from abroad.

Further information may be found at the center's preliminary website `http://www.math.tu-berlin.de/DFG-Forschungszentrum/`.

—Allyn Jackson

RAND Report on Research in Mathematics Education

In March 2002 RAND Education & Science and Technology Policy Institute issued a draft report about research in mathematics education. The report, *Mathematical Proficiency for All Students: Toward a Strategic Research and Development Program in Mathematics Education*, was commissioned by the Office of Educational Research and Improvement (OERI) of the U.S. Department of Education. If the recommendations in the report are carried out, they could have a significant impact on the nature and direction of research in mathematics education and on how that research translates into classroom practice.

The report argues that one reason the many efforts to improve mathematics education in the United States have not shown solid, sustained results is that the knowledge base of mathematics education research is too weak. This weakness, the report says, stems from inadequate funding and the lack of a coherent, practice-oriented vision for research in mathematics education. The purpose of the RAND study is to develop such a vision.

Because the resources available for research in mathematics education are quite limited relative to the scale of the problems, the draft report recommends a research program focused on three high leverage areas. The first area is the teaching and learning of algebra for mathematical proficiency. The report argues that algebra is important in all areas of mathematics "because it provides fundamental tools for representing quantities and relationships, modeling situations, solving problems, and stating and proving generalizations." Algebra also serves a "gatekeeper" role: students who do not know algebra usually cannot proceed to higher-level mathematics courses.

The second focal point is the learning, use, and teaching of mathematical practices. The report defines mathematical practices as the tools, skills, and habits of mind that allow people to use their mathematical knowledge flexibly and to adapt that knowledge to diverse situations. These tools, skills, and habits of mind are "less-visible, often implicit, aspects of mathematical thinking," the report says. A better and more precise understanding of mathematical practices would help teachers to explicitly teach those practices to students.

The third focal point is knowledge of mathematics for teaching. The report points out that the kind of mathematical knowledge needed to teach school mathematics effectively is different from that needed by mathematicians to do research in mathematics. However, exactly what kind of knowledge teachers need is not well understood. A

better understanding would provide a basis for making changes in the academic preparation of teachers as well as in professional development programs.

The report describes a plan for carrying out research in mathematics education designed with these three focal points in mind. The need for an interdisciplinary approach combining the expertise of different people, including mathematicians, is emphasized. Because the different groups contributing to and using the research are diffuse and not well integrated, government agencies, such as OERI and the National Science Foundation, would play key roles in orchestrating the research program. The report also recommends the formation of a standing study panel to help government agencies to assess and synthesize the research.

The draft report is available on the website `http://www.rand.org/multi/achievementforall/`. Comments were solicited from various individuals having an interest in mathematics education, and the comments are posted on the website. The Department of Education asked the AMS Committee on Education (COE) to provide comments on the report, and the comments were sent to the RAND study panel in July 2002. Current plans call for the report to be published by the end of 2002.

The RAND Mathematics Study Panel is chaired by Deborah Loewenberg Ball of the University of Michigan. Also on the panel are Hyman Bass of the University of Michigan, Joan Ferrini-Mundy of Michigan State University, Ramesh Gangolli of the University of Washington, Roger Howe of Yale University, W. James Lewis of the University of Nebraska, and Mark Saul of the Bronxville schools. Howe is chair of the COE, and Bass and Lewis are members of the COE.

—Allyn Jackson

News from MSRI

The Mathematical Sciences Research Institute in Berkeley, California, will feature the following three programs during the 2002–2003 academic year:

Commutative Algebra (Fall 2002-Spring 2003). Commutative algebra comes from several sources: the nineteenth-century theory of equations, number theory, invariant theory, and algebraic geometry. A significant development over the past twenty years is the role that commutative algebra is taking as a tool for solving problems from a rapidly expanding list of disciplines. This year-long program will highlight these recent developments and will include the following areas: tight closure and characteristic p methods, toric algebra and geometry, homological algebra, representation theory, singularities and intersection theory, combinatorics and Gröbner bases. Program committee: Luchezar Avramov, Mark Green, Craig Huneke (chair), Karen E. Smith, and Bernd Sturmfels.

Quantum Computation (Fall 2002). Quantum computation is an intellectually challenging and exciting area that touches on the foundations of both computer science and quantum physics. It has drawn on a number of mathematical areas, including computational complexity theory, group representation theory, topology, and information theory. This program will present an introductory workshop August 26–30 that will introduce quantum computing to a broad audience. Three further workshops will follow in the fall: Quantum Algorithms and Complexity, Quantum Information Theory and Cryptography, and Quantum Information Processing. Program committee: Dorit Aharonov, Charles Bennett, Richard Jozsa, Yuri Manin, Peter Shor, and Umesh Vazirani (chair).

Semiclassical Analysis (Spring 2003). Semiclassical analysis studies the transition between quantum and classical mechanics. It has been a central topic in science since the 1920s, and it still generates many questions of both a fundamental and technical nature. The traditional mathematical study of semiclassical analysis has developed tremendously in the past thirty years. The purpose of this program is to bring together experts in traditional mathematical semiclassical analysis, in the new mathematics of "quantum chaos", and in physics and theoretical chemistry. There will be two workshops with different foci: the first oriented toward physics and chemistry and the second toward mathematics. Program committee: Robert Littlejohn, William H. Miller, Johannes Sjöstrand, Steven Zelditch, and Maciej Zworski (chair).

In addition to these programs, MSRI also continues the Complementary Program, in which applications from candidates working in any field of mathematics are welcome. Candidates should specify why a fellowship at MSRI at this time is particularly relevant for their research, for example, by describing potential interactions with one of the above fields or indicating interest in one or more of MSRI's joint industrial fellow/internships.

Further information and application forms are available from `http://www.msri.org/` or by writing to MSRI, 1000 Centennial Drive, Berkeley, CA 94720-5070.

—From an MSRI announcement

Correction

The interview with Louis Nirenberg that appeared in the April 2002 issue of the *Notices* included a photograph on page 446 showing participants in a joint Soviet-American conference held in Novosibirsk in 1963. In the caption the names of two of the participants are reversed: Mikhail Alekseevich Lavrent'ev is in the first row, and his son, Mikhail Mikhailovich Lavrent'ev, is in the sixth row.

—Allyn Jackson